

**TBPOC CONFERENCE CALL
April 9, 2013, 5:00pm – 6:00pm**

	Topic	Presenter	Time	Desired Outcome
1.	CHAIR'S REPORT	S. Heminger, BATA		Information
2.	SAN FRANCISCO-OAKLAND BAY BRIDGE UPDATES			
	a. Status Update on Anchor Rods	T. Anziano, CT	15 min	Information
	b. Draft Presentation to BATA Oversight Committee April 10, 2013 Meeting*	PMT	30 min	Approval
	c. Summary of Media Release Package	A. Gordon, BATA	15 min	Information
3.	OTHER BUSINESS			
Next TBPOC Conference Call: April 11, 2013, 3:00pm – 4:00pm				

* Attachments

** Attachments at end of binder

*** Attachments to be sent under separate cover

ITEM 1: CHAIR'S REPORT

No Attachments

Memorandum

TO: Toll Bridge Program Oversight Committee **DATE:** April 9, 2013
(TBPOC)

FR: Tony Anziano, Toll Bridge Program Manager, CT

RE: Agenda No. - 2a
San Francisco-Oakland Bay Bridge Updates
Item- Status Update on Anchor Rods

Recommendation:

For Information Only

Cost:

N/A

Schedule Impacts:

N/A

Discussion:

A verbal update on the recent failure of some anchor rods on the bridge will be provided at the TBPOC April 9 conference call.

Attachment(s):

N/A

TO: Toll Bridge Program Oversight Committee (TBPOC) **DATE:** April 9, 2013

FR: Program Management Team (PMT)

RE: Agenda No. - 2b
San Francisco-Oakland Bay Bridge Updates
Item- Draft Presentation to BATA Oversight Committee April 10, 2013
Meeting

Recommendation:
APPROVAL

Cost:
N/A

Schedule Impacts:
N/A

Discussion:

Attached are two sets of slides, a BATA version and a Caltrans version, that will be presented to the BATA OC meeting tomorrow. A verbal description/update will be provided at the TBPOC April 9 conference call.

Attachment(s):

1. Slide Presentation – BATA version
2. Slide Presentation – Caltrans version

ITEM 2b: Attachment 1

Slide Presentation - BATA Version



THE SAN FRANCISCO-OAKLAND
BAY BRIDGE
SEISMIC SAFETY PROJECT

BATA Oversight Committee – April 10, 2013

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION

- AB 144 established the ***Toll Bridge Program Oversight Committee***, composed of Director of the California Department of Transportation (Caltrans), and the Executive Directors of the California Transportation Commission (CTC) and the Bay Area Toll Authority (BATA), to be accountable for delivering the SRP.



MALCOLM DOUGHERTY
Director
California Department of
Transportation



STEVE HEMINGER
Executive Director
Bay Area Toll Authority



ANDRE BOUTROS
Executive Director
California Transportation
Commission



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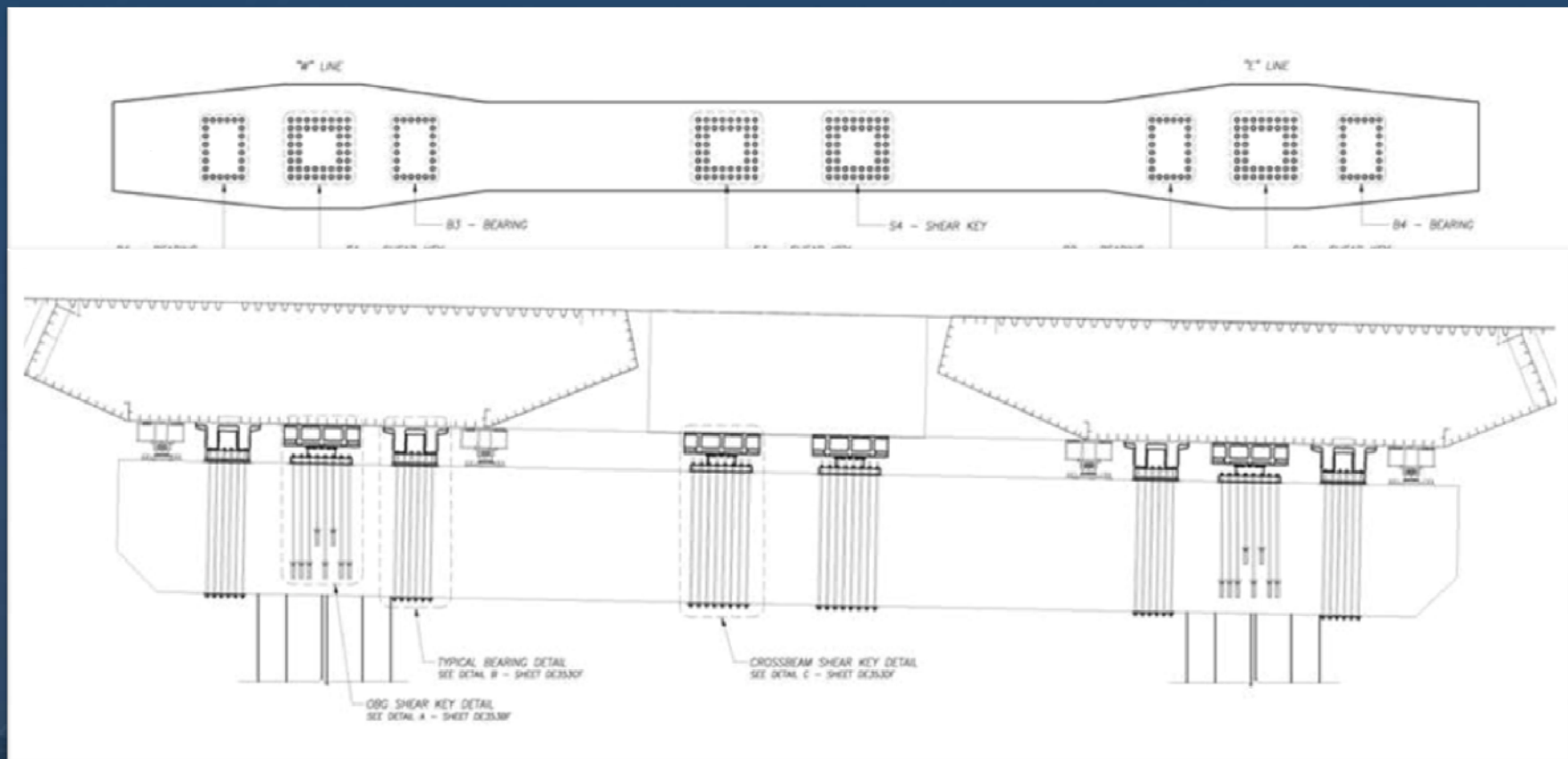
Accountability



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Pier E2



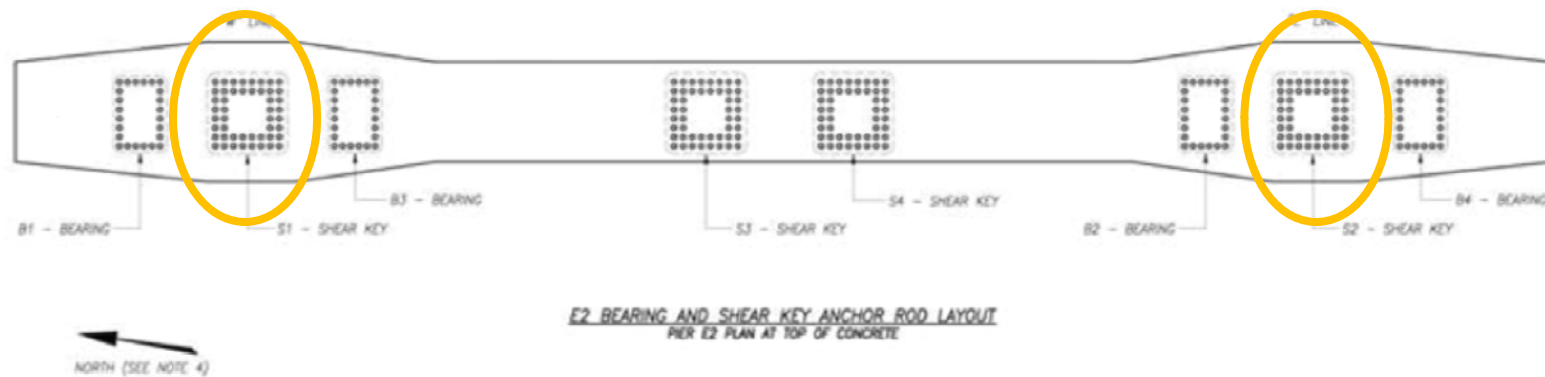
Bearings and shear keys are secured to E2 by 3 inch diameter anchor rods, ranging from 9 feet to 24 feet in length

Each bearing has 24 anchor rods and each shear key has 48 anchor rods for a total of 288 anchor rods



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Shear key and bearing anchor rods could not be stressed until completion of load transfer

Stressing began on March 1 of this year, starting with 2008 anchor rods (total of 98 rods)

32 Fractured rods were discovered between March 8 and March 15

Remaining rods (total of 192) have been untensioned pending resolution of problem.



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■ **Quality Control By Contractor**

- **Mill Certifications**
- **Independent Laboratory Testing of Material Properties**
- **Certificates of Compliance**

■ **Quality Assurance By Caltrans**

- **Pre-fabrication facility audits**
- **Regular inspections during fabrication**
- **In-house laboratory testing**
- **Non-Compliance Reports**



- **Non-Conformance Reports (NCR's) are a normal part of Quality Assurance process.**
- **Two Non-Conformance Reports were issued for fabrication of the 2008 rods**
- **This level of Non-Conformance is not unusual and is reflective of the complex Quality Control/Quality Assurance process**
- **First related to a paperwork issue**
- **Second related to the test results for the 2008 rods**



- **Out of the 156 individual results obtained from both quality control and quality assurance testing; only 5 results were below specifications.**
- **All 5 involved one mechanical property – elongation.**
- **The specification requires a minimum of 14% elongation, and 5 results were in the range of 12.5-13.6%, or 1.5-0.4% below specification.**
- **These results were reviewed by design and construction and the material was determined to be suitable for use.**





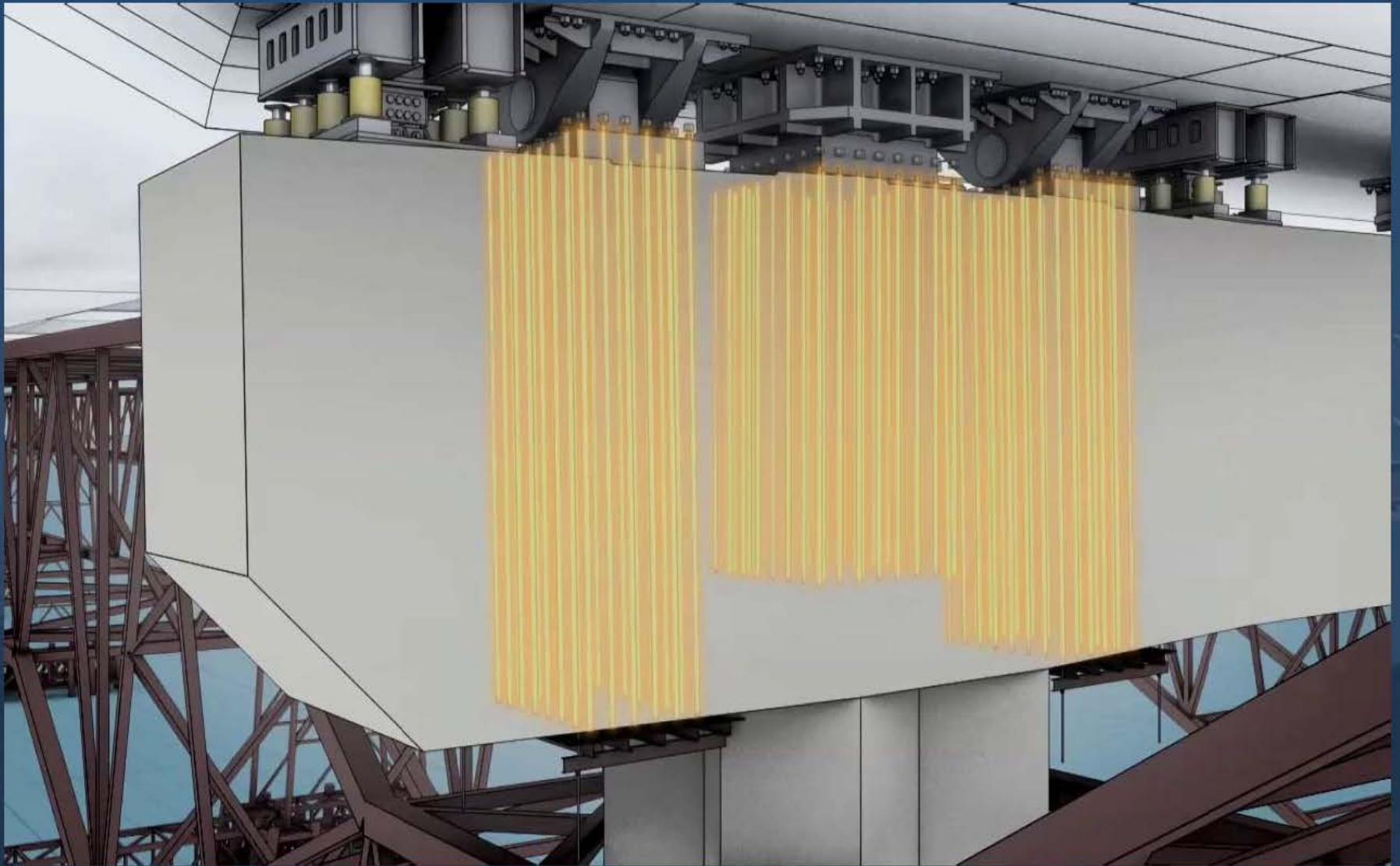
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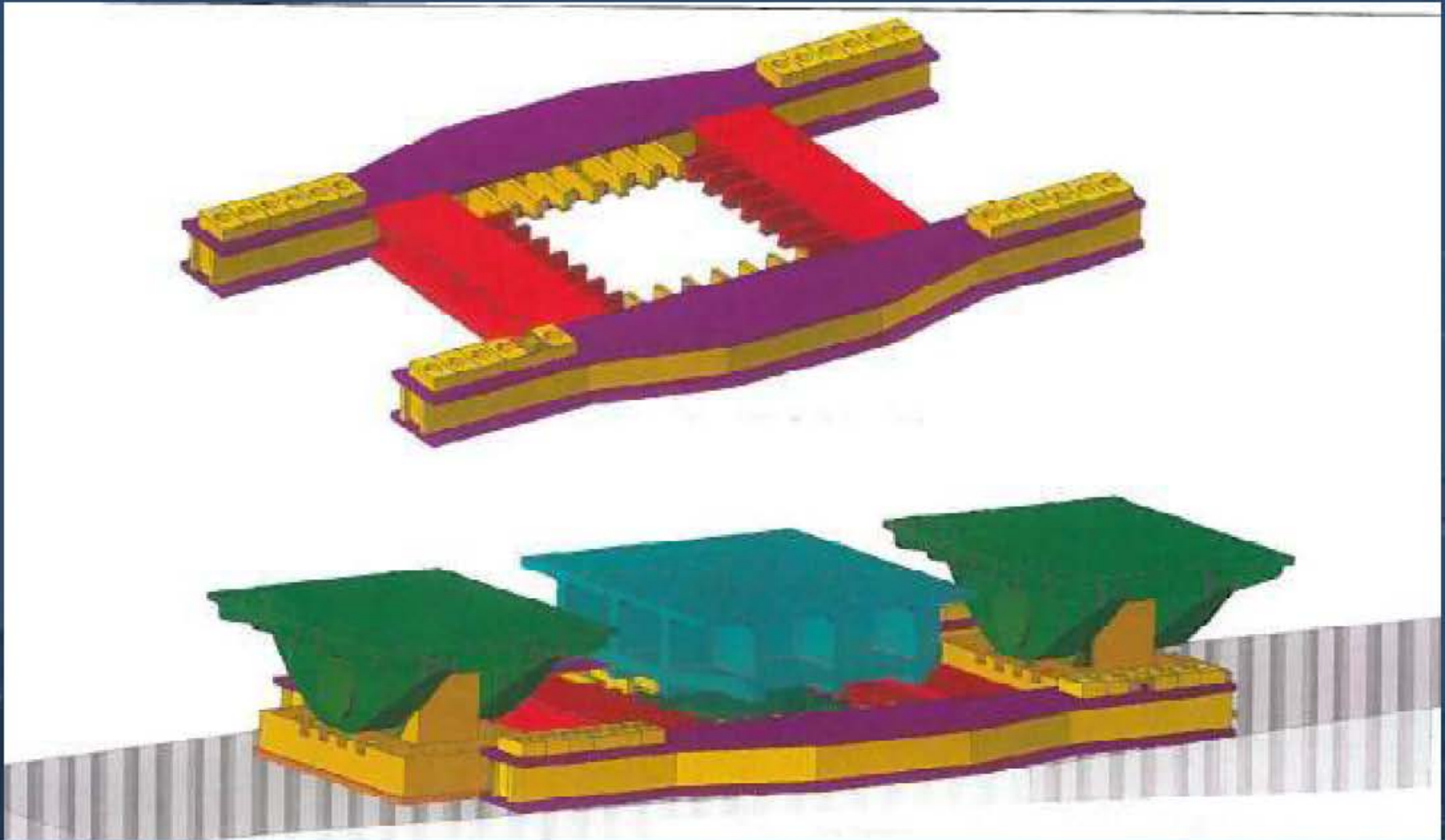
**One fractured rod
sent to lab for
testing**

**Testing included
electron
microscopy and
mechanical
property tests**



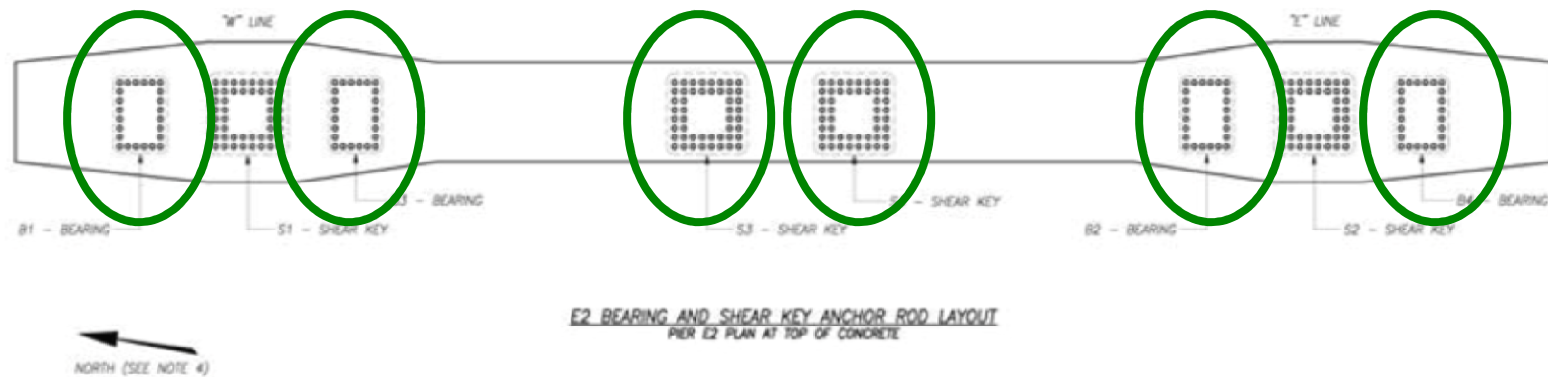
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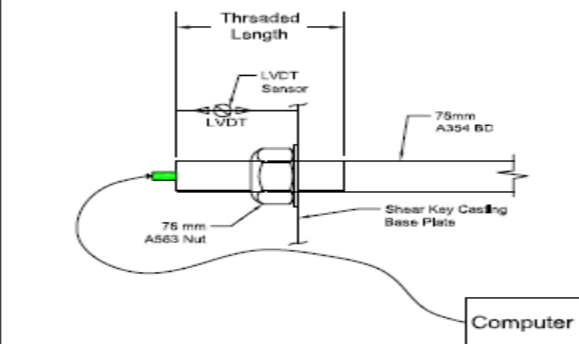
- Remaining 192 anchor rods for other shear keys and bearings were fabricated later in 2010 and installed in 2011.
- These rods have passed all Quality Control/Quality Assurance steps and testing.
- These rods will be re-inspected and tested on site as well in laboratories

■



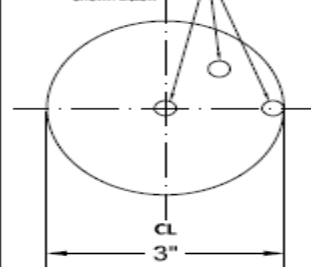
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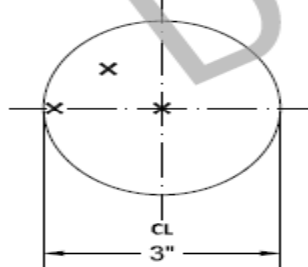
Anchor Rod Testing
(Test Setup)

Perform tensile tests
Three 505 Samples as
shown below



Section A

NTS - Sample as close to the
fractured surface as practical.



Section B

NTS - Sample as close to the
fractured surface as practical.

Bay Bridge Anchor Rod Testing (192 Rods)

Sample Selection:

1. In-Situ testing shall be performed on all 192 anchor rods as described below.
2. Select 10 different rods for extended testing. 10 rod sample size (~ 5%) is larger than ASTM F1470 requirements of 7 bars for lot size of 151 to 280 rods.

In-Situ Testing Protocol:

1. Mark the rods selected for extended testing to identify the jacking end.
2. Install acoustic measuring devices on each of the 10 sample rods selected for extended testing.
3. Load all 192 rods up to 0.75Fu (with seating loss expected to bring the final tension in the rods down to the Design load of 0.7Fu).
4. Maintain the applied load for 30 days, during which all rods will be visually inspected daily, checking for failures.
5. METS will monitor the acoustic measuring output on the 10 rods selected for the extended testing.
6. If any rod (of the total lot of 192 rods) fails prior to the 30 day testing period, extract and perform post fracture analysis as detailed below under "Extended Testing Protocol".
7. If no rods fail within the 30 day period, extract the 10 sample rods, transport to a testing facility/load bed.

Extended Testing Protocol:

(Tests listed below to be performed at an independent testing laboratory accredited per ISO 17025 or approved by Caltrans).

1. Load the 10 samples to failure. The rods shall be jacked at the same ends as they were jacked during the in-situ testing.
2. Perform Charpy V-Notch testing of broken rods at room temperature and at 40 degrees F.
3. Perform reduced section tensile tests (.505 diameter) of the broken rods as close to the fracture surface as possible. Tensile tests to be performed as detailed in Section A.
4. Perform hardness Testing (Rockwell C and Knoop Micro-hardness) of broken rods.
5. Perform chemical analysis of broken rods at the threaded area and at the shank. Chemical tests to be performed as detailed in Section B.
6. Perform scanning electron microscopy - examination of fracture features on broken rods.
7. Perform Micro-structural examination of broken rods at the threaded area.

Note: It is expected that loading of the 192 bolts for 30 days will allow any existing hydrogen atoms to propagate in between the grain boundaries of the steel. Therefore, even if the bolts do not fail within the 30 day period, the scanning electron microscopy will provide sufficient information necessary to determine presence of Hydrogen.

Revision No.	By	Date	SELF-ANCHORED SUSPENSION BRIDGE		
			E2 Bearings & Shear Keys - Testing Protocol		
			Drawn By: BD	SHEET NUMBER	SK-01
			Date: 4/1/2013		

10 sample rods selected for instrumentation

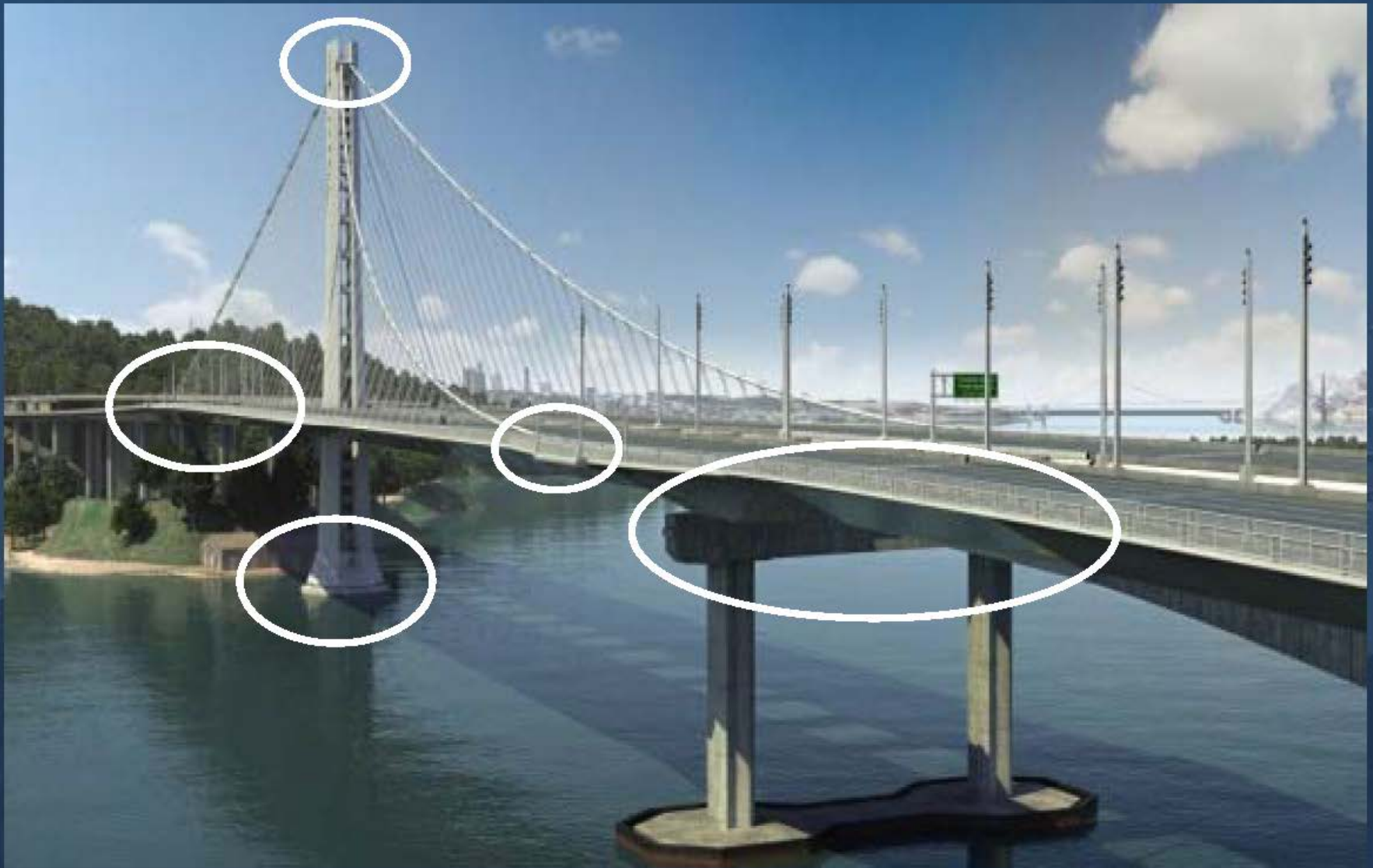
All 192 rods stressed per plan

10 sample rods will be removed for destructive testing



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Summary

**Continuing investigation on cause of failure in
2008 anchor rods**

Continuing design of shear key retrofit

Tensioning and testing of 2010 anchor rods

Continuing communication at BATA meetings



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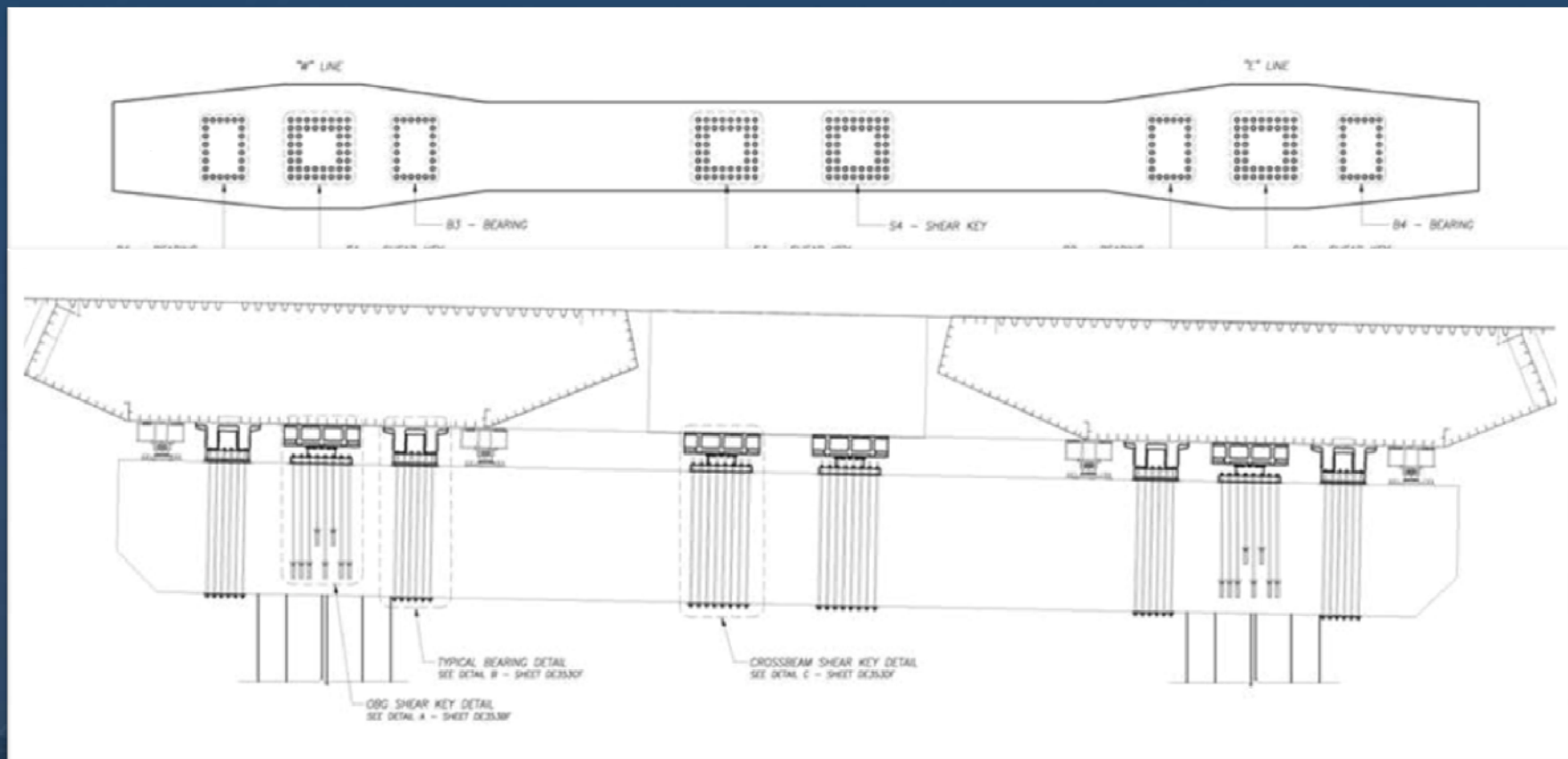
ITEM 2b: Attachment 2

Slide Presentation - Caltrans Version



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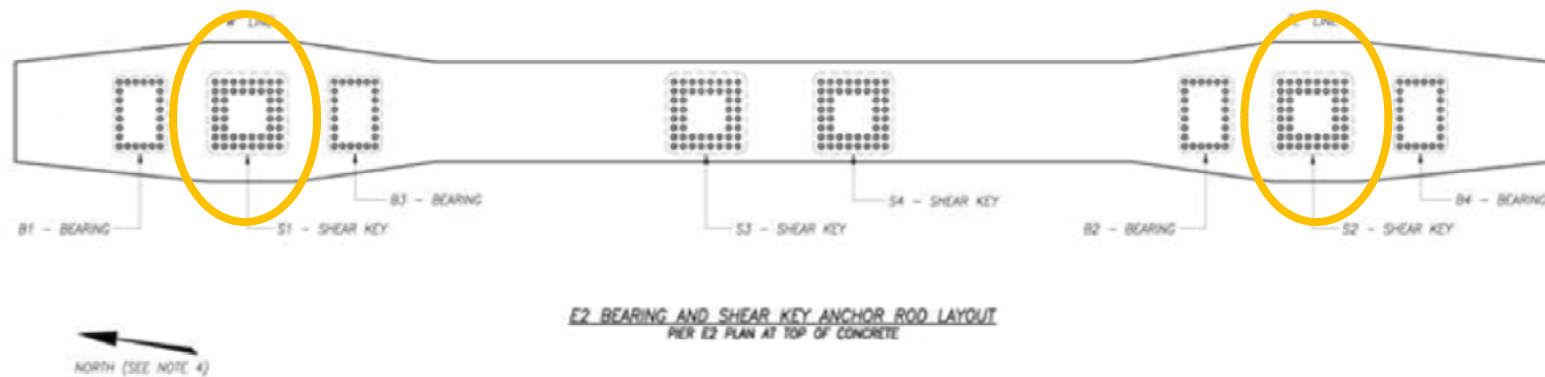
Bearings and shear keys are secured to E2 by 3 inch diameter anchor rods, ranging from 9 feet to 24 feet in length

Each bearing has 24 anchor rods and each shear key has 48 anchor rods for a total of 288 anchor rods



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98 shear key anchor rods were fabricated and installed in 2007-2008

Installation required at that time due to embedment of rods in cap beam

Fabrication began in July 2007 with Quality Assurance audits of all fabrication facilities



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QUALITY CONTROL ACTIONS

Steel mill certification of chemical composition

Independent laboratory testing of mechanical properties (yield, strength, elongation, reduction of area) of mill stock

Independent laboratory testing of mechanical properties post heat treatment

Mill readings of galvanization thickness

Certifications of compliance

.



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QUALITY ASSURANCE ACTIONS

Pre-fabrication audits of all facilities involved in fabrication

Regular inspection of facilities during fabrication

In-house laboratory testing of mechanical properties post heat treatment

In-house laboratory testing of mechanical properties post galvanization.



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LABORATORY TESTING

Testing was performed at 5 different facilities. Out of over 150 individual results obtained from both quality control and quality assurance testing; only 5 results were slightly below specifications.

All 5 involved one mechanical property – elongation. The specification requires a minimum of 14% elongation, and 5 results were in the range of 12.5-13.6%, or 1.5-0.4% below specification. An additional 15 results for elongation met or exceeded the specification.

These results were reviewed by design and construction engineers and the material was determined to be suitable for use.



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NON CONFORMANCE REPORTS

These reports are a normal part of the Quality Assurance process.

Two Non-Conformance Reports were issued for fabrication of the 2008 rods.

One related to a paperwork issue

The second related to the elongation test results for the 2008 rods. This report references a third Non-conformance report relating to nuts .

This level of Non-Conformance is not unusual and is reflective of the thorough Quality Control/Quality Assurance process .



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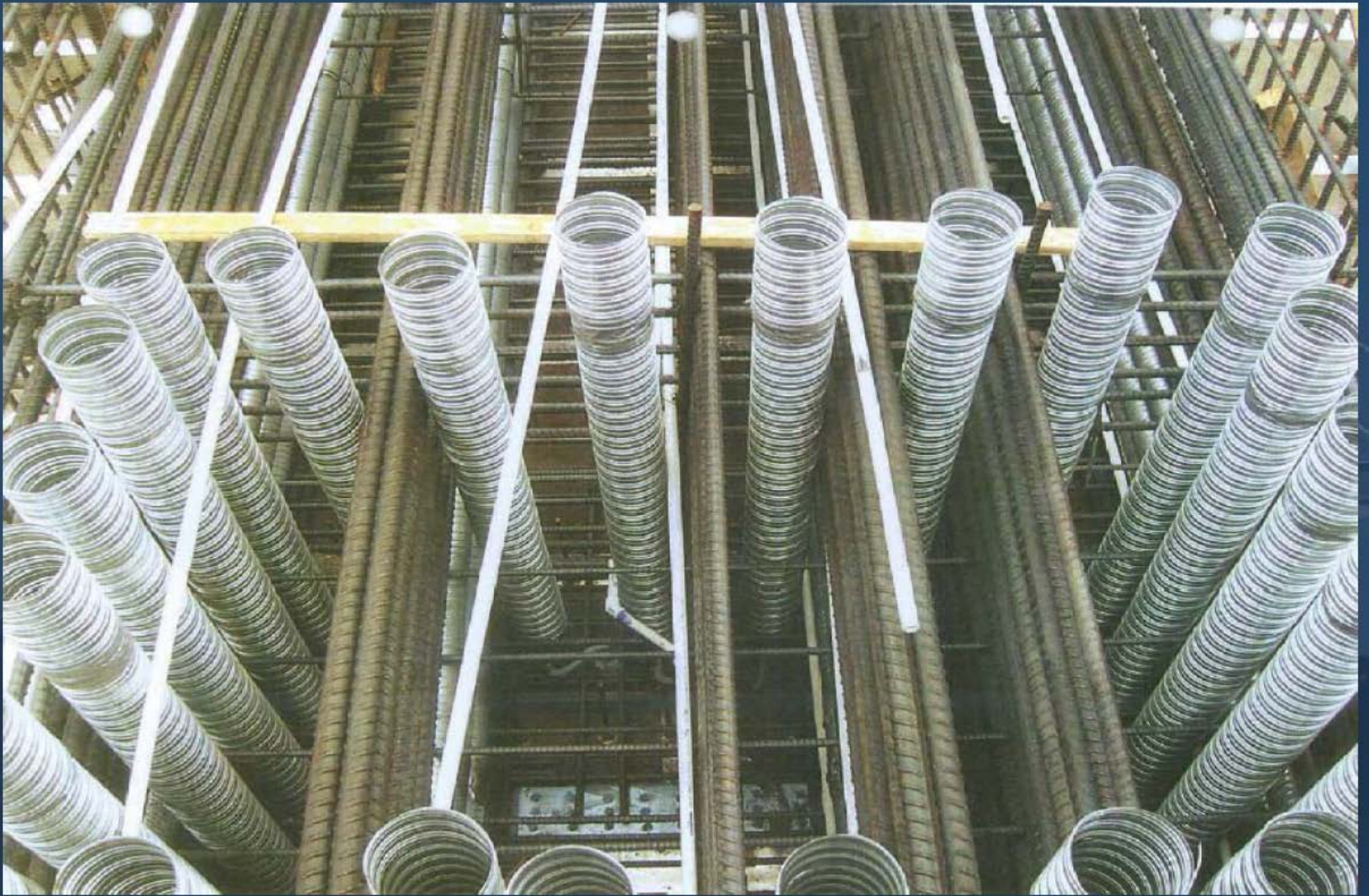
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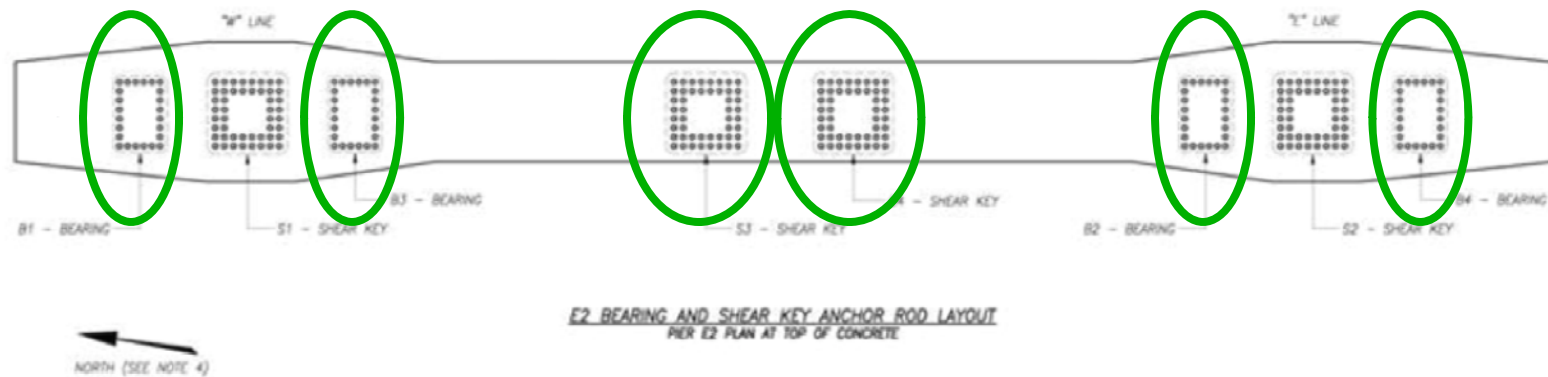
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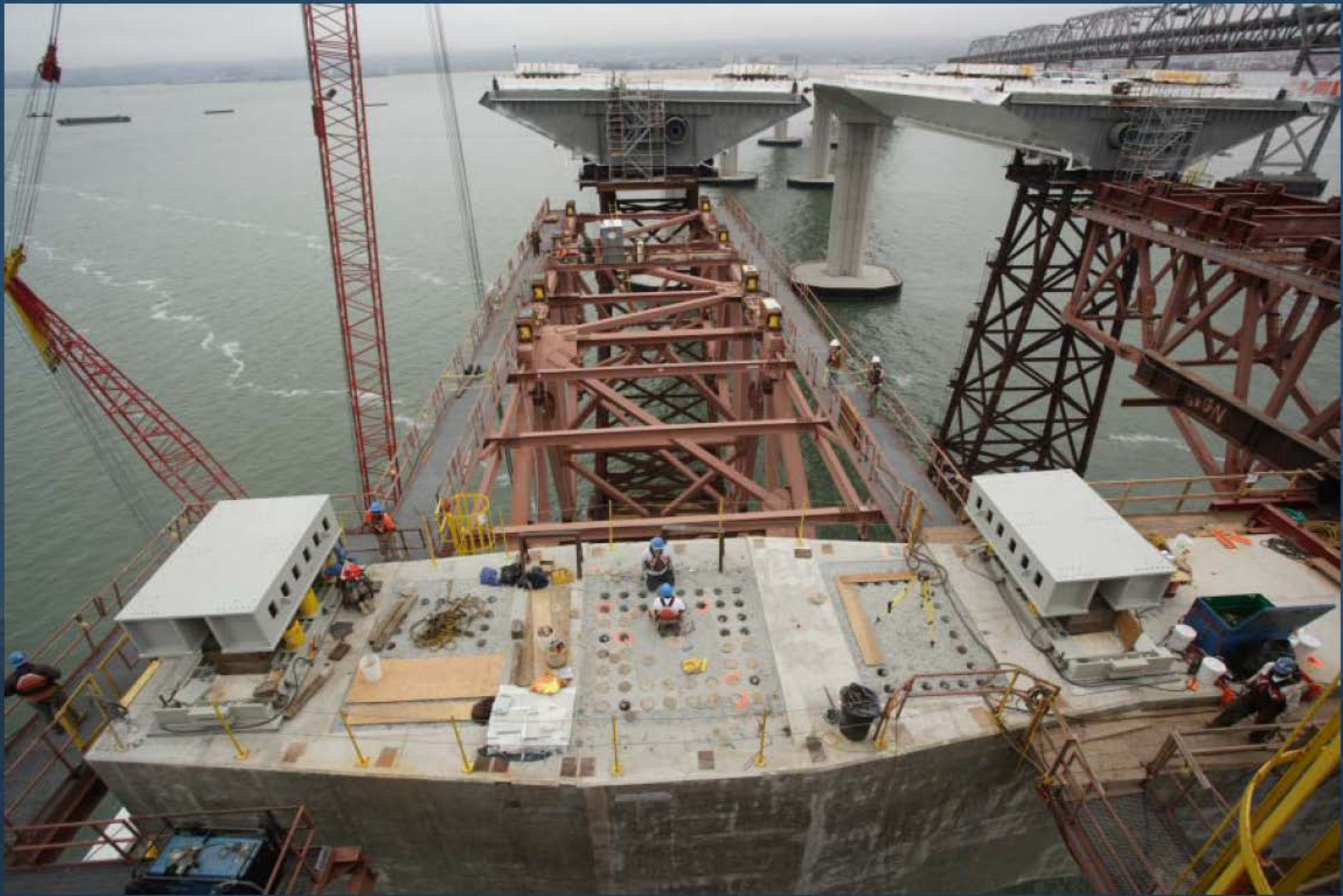
**192 shear key and bearing anchor rods
were fabricated in 2010 and installed in
2011**

**All passed all Quality Control/Quality
Assurance steps and testing**



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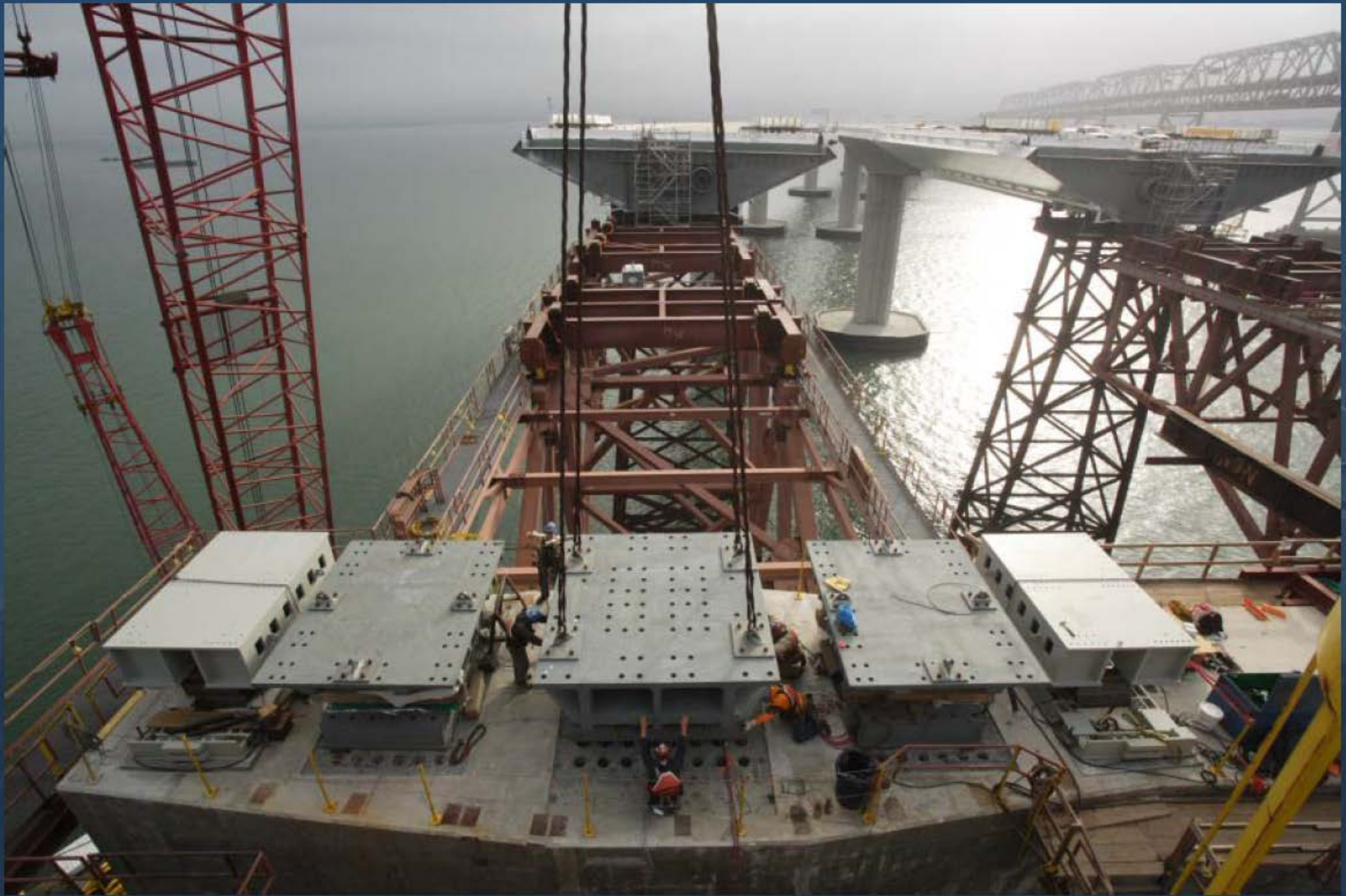
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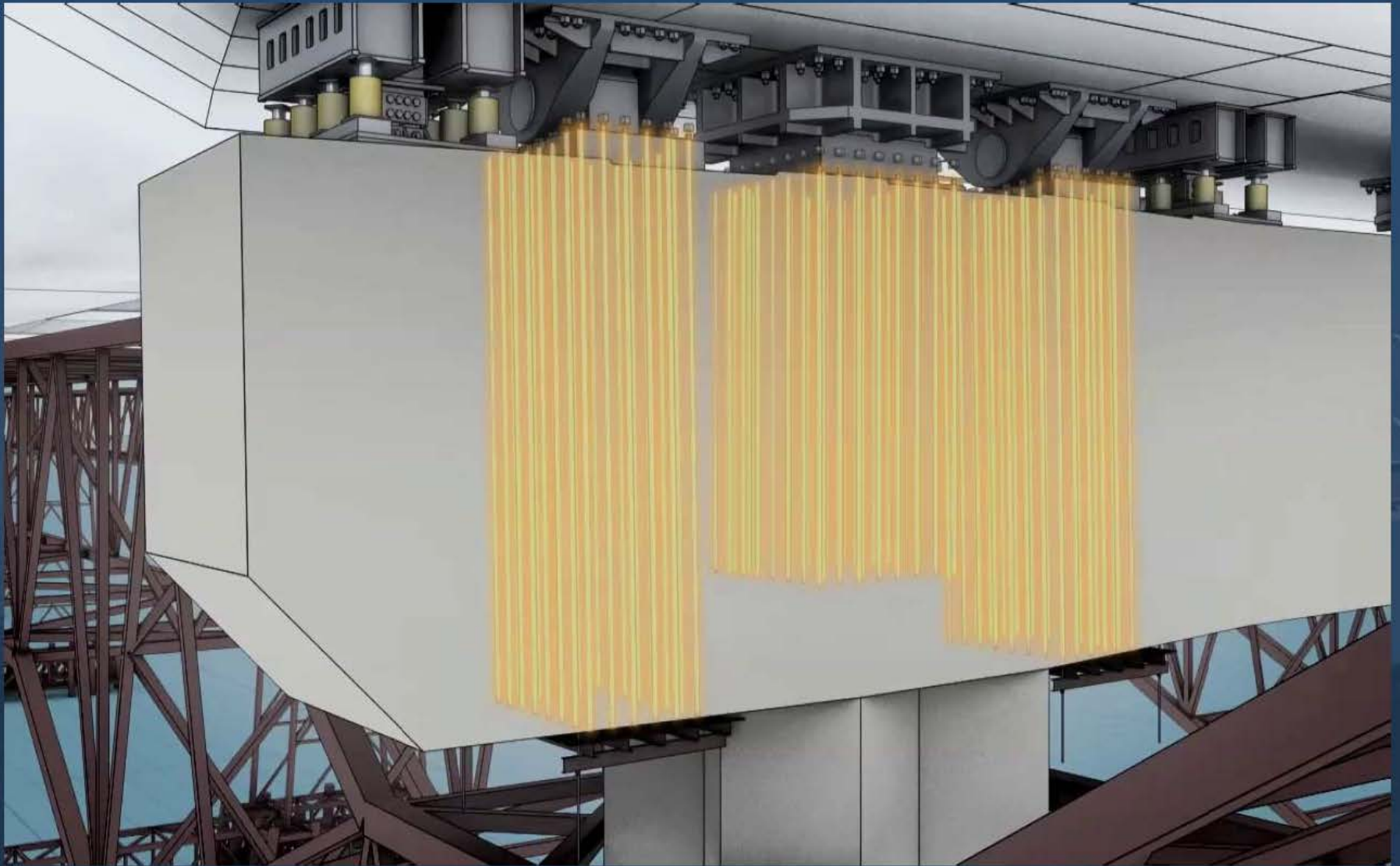
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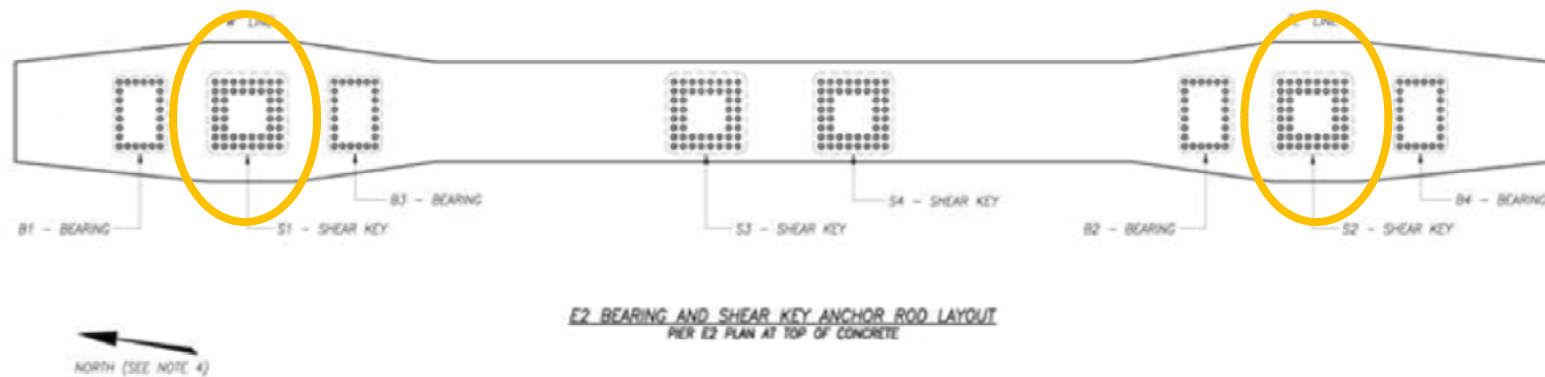
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Shear key and bearing anchor rods could not be stressed until completion of load transfer

Stressing began on March 1 of this year, starting with 2008 anchor rods (total of 98 rods)

32 Fractured rods were discovered between March 8 and March 15

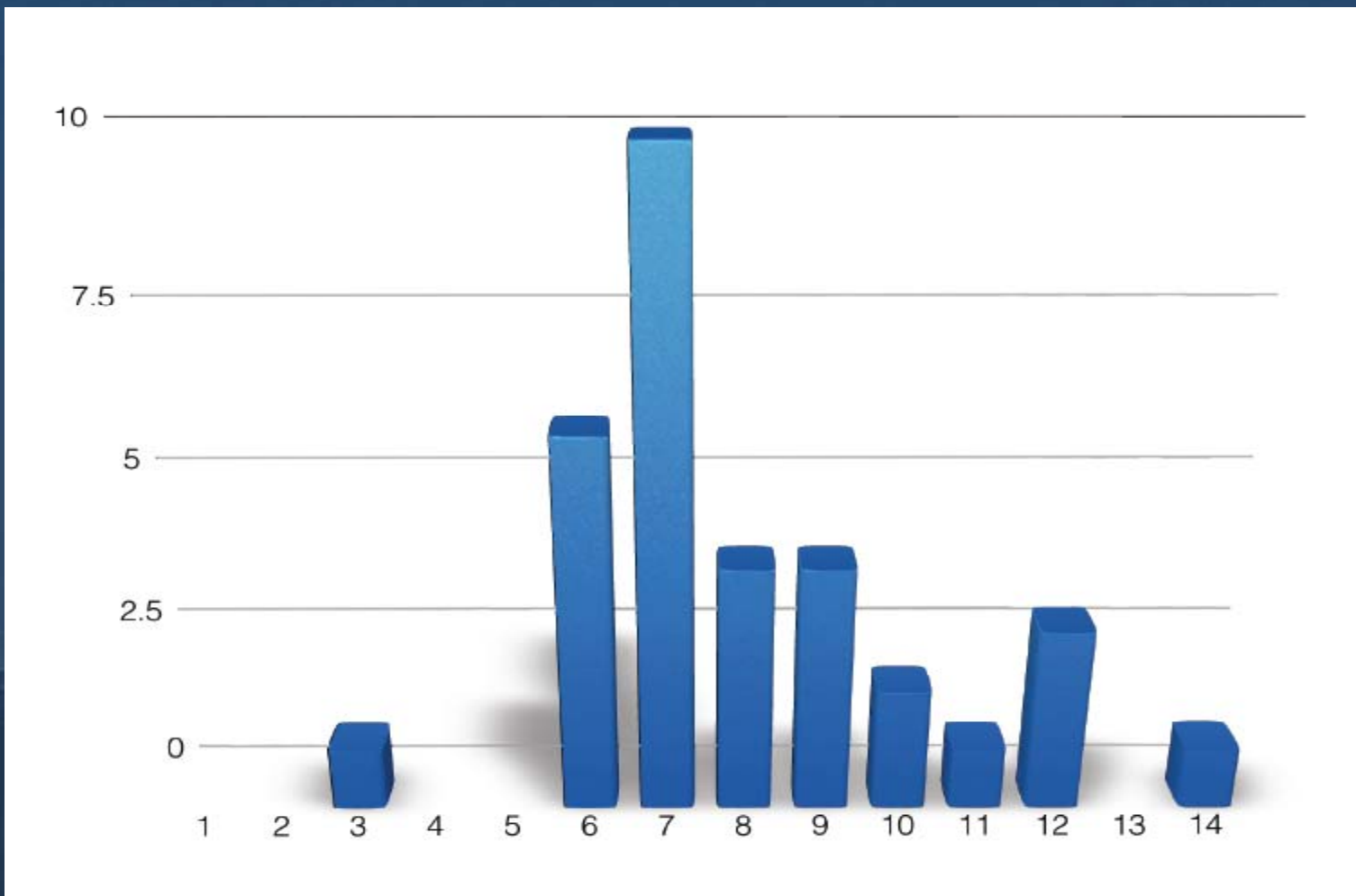
Remaining rods (total of 192) have been untensioned pending resolution of problem.



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R O D F R A C T U R E S



DAYS AFTER STRESSING



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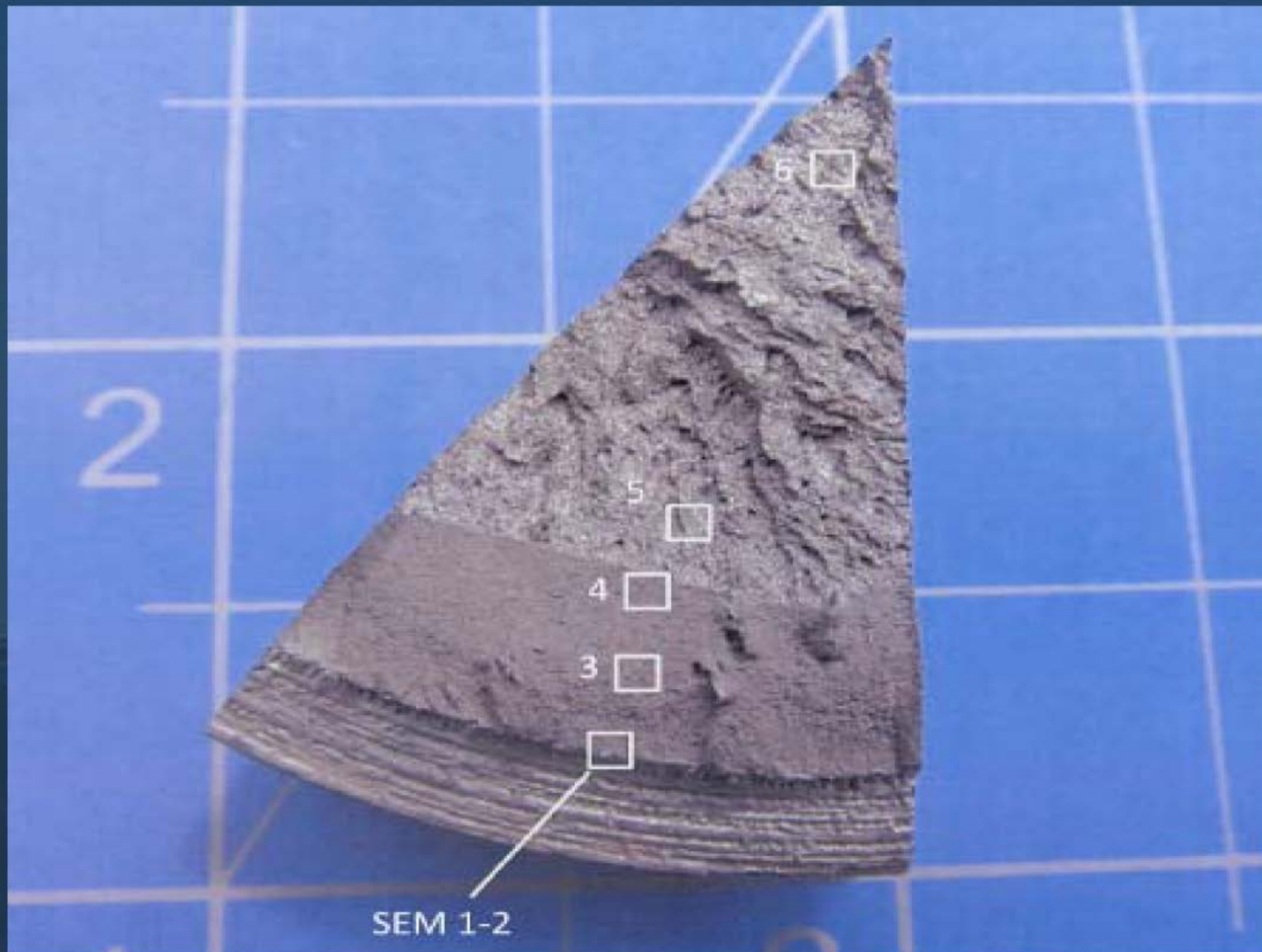
**One fractured rod
sent to lab for
testing**

**Testing included
electron
microscopy and
mechanical
property tests**



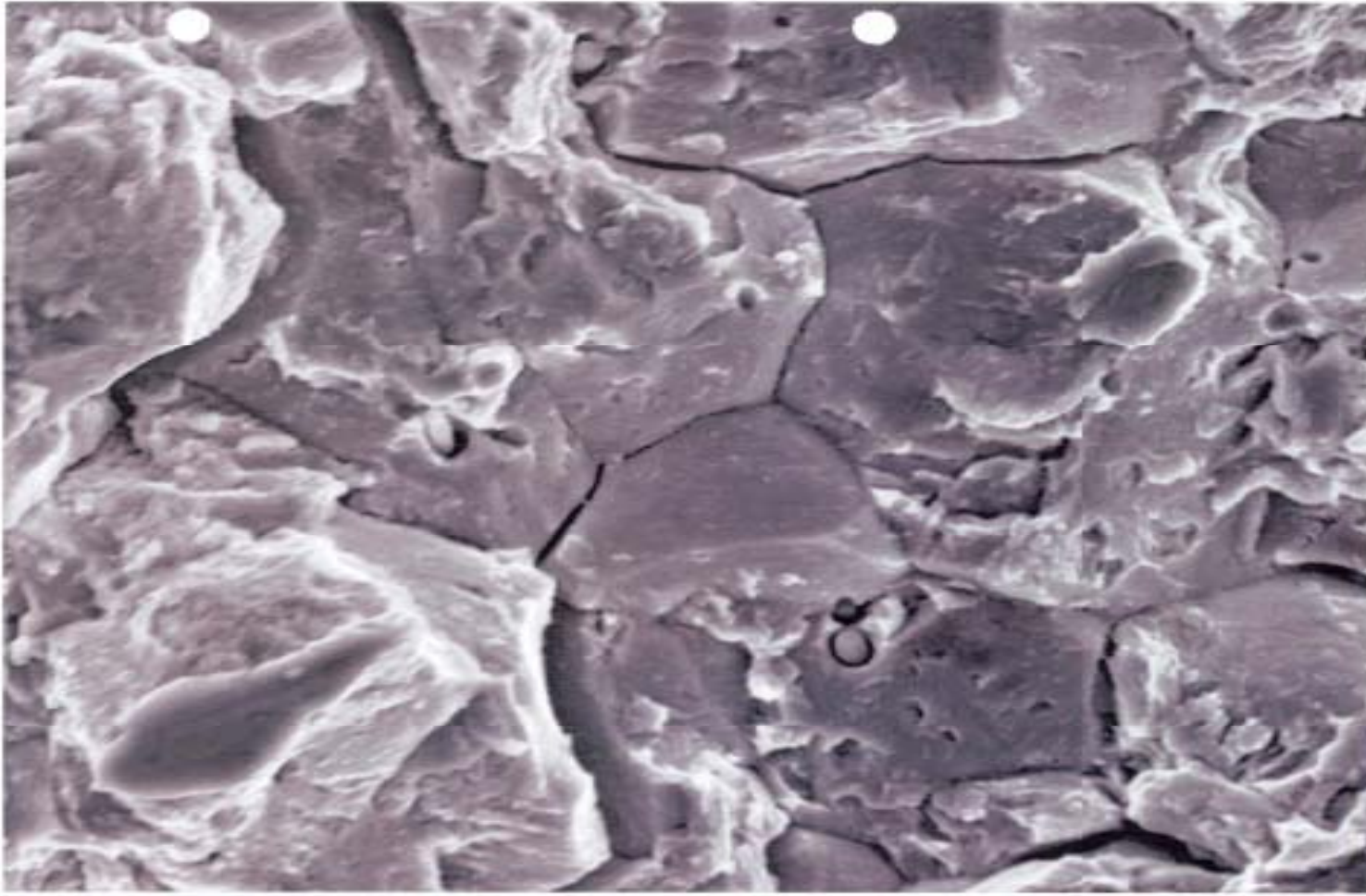
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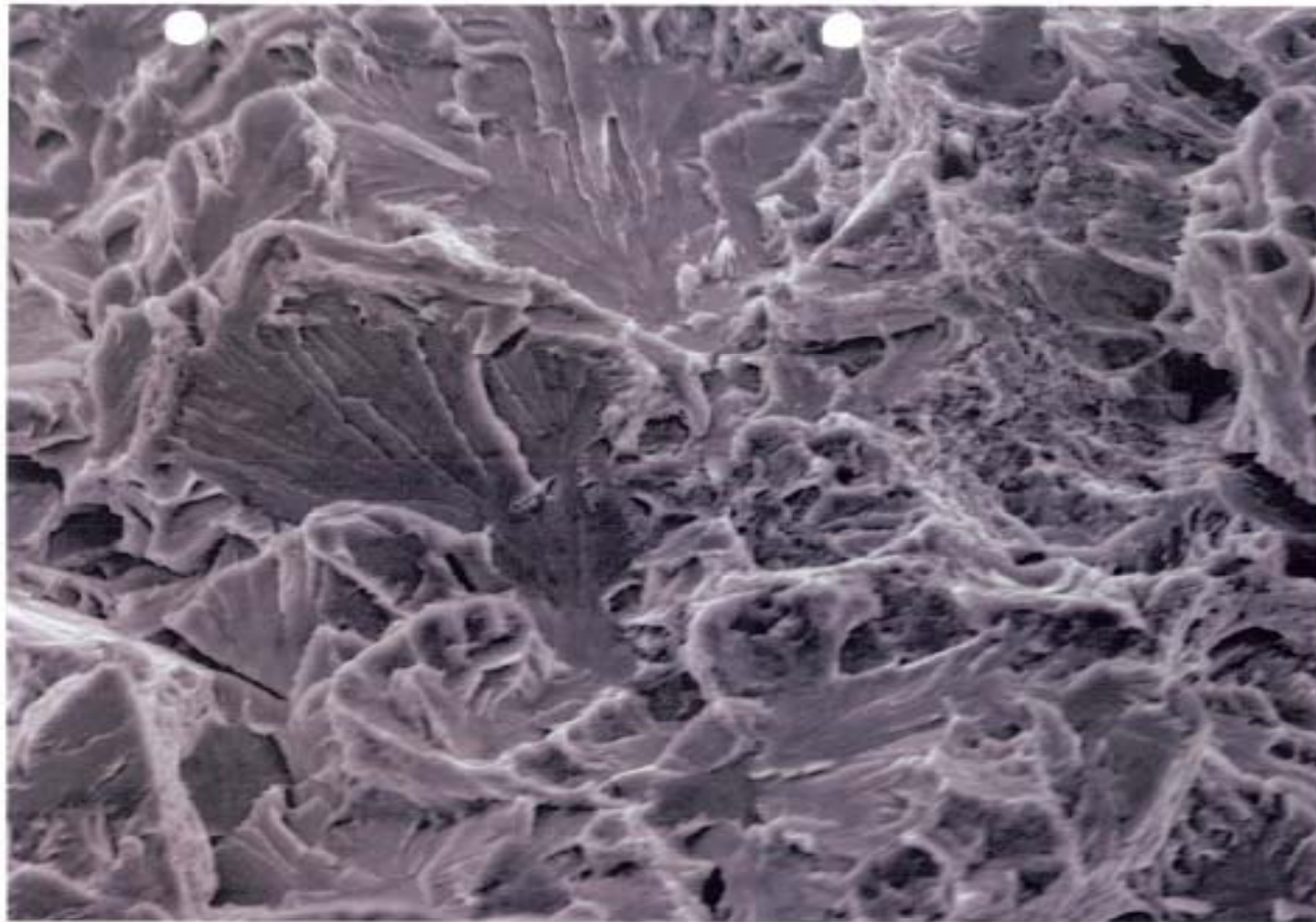
SEM 2

1000X Magnification
From “crescent moon”: area of sample



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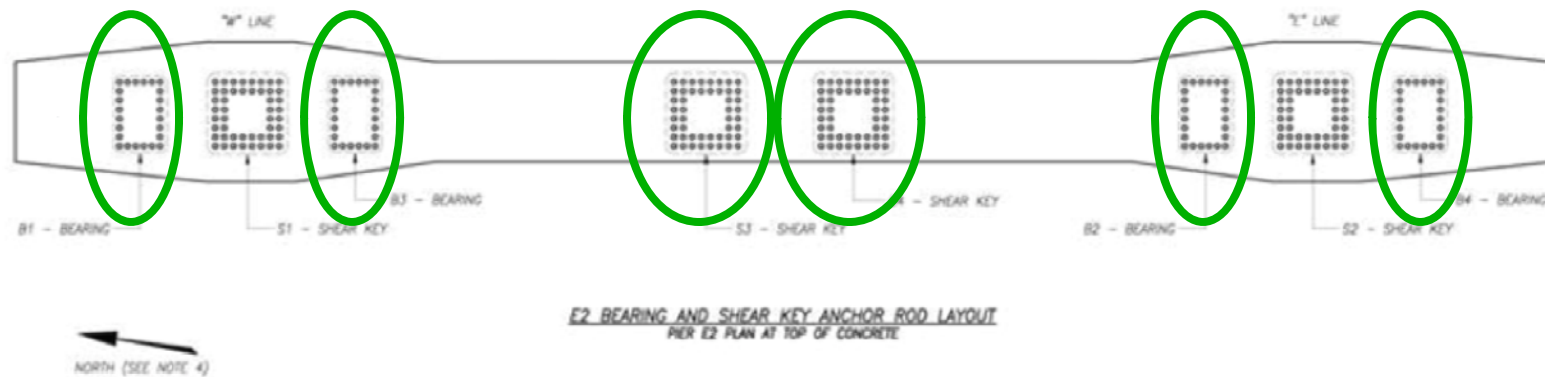
SEM 5

1000X Magnification
From interior area of sample (center of rod)



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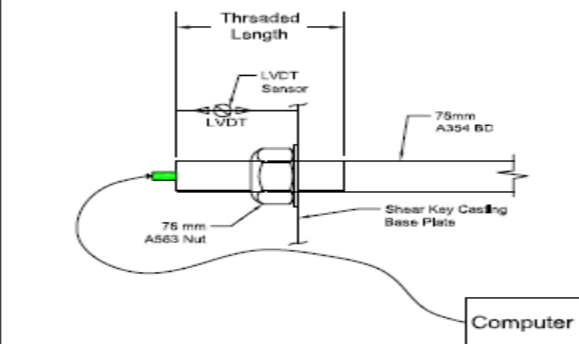
In addition to initial resting of fracture sample and development of a design solution for the S1 and S2 shear keys, a testing plan has been developed for the remaining 192 anchor rods

Testing will be on site as well as in laboratories



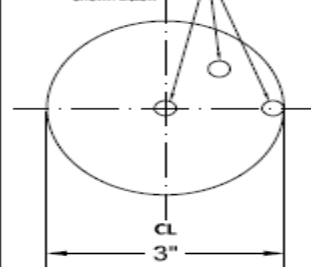
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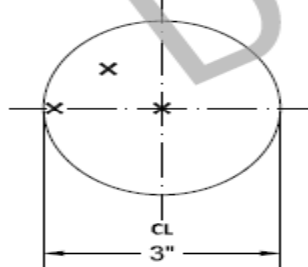
Anchor Rod Testing
(Test Setup)

Perform tensile tests
Three 505 Samples as
shown below



Section A

NTS - Sample as close to the
fractured surface as practical.



Section B

NTS - Sample as close to the
fractured surface as practical.

Bay Bridge Anchor Rod Testing (192 Rods)

Sample Selection:

1. In-Situ testing shall be performed on all 192 anchor rods as described below.
2. Select 10 different rods for extended testing. 10 rod sample size (~ 5%) is larger than ASTM F1470 requirements of 7 bars for lot size of 151 to 280 rods.

In-Situ Testing Protocol:

1. Mark the rods selected for extended testing to identify the jacking end.
2. Install acoustic measuring devices on each of the 10 sample rods selected for extended testing.
3. Load all 192 rods up to 0.75Fu (with seating loss expected to bring the final tension in the rods down to the Design load of 0.7Fu).
4. Maintain the applied load for 30 days, during which all rods will be visually inspected daily, checking for failures.
5. METS will monitor the acoustic measuring output on the 10 rods selected for the extended testing.
6. If any rod (of the total lot of 192 rods) fails prior to the 30 day testing period, extract and perform post fracture analysis as detailed below under "Extended Testing Protocol".
7. If no rods fail within the 30 day period, extract the 10 sample rods, transport to a testing facility/load bed.

Extended Testing Protocol:

(Tests listed below to be performed at an independent testing laboratory accredited per ISO 17025 or approved by Caltrans).

1. Load the 10 samples to failure. The rods shall be jacked at the same ends as they were jacked during the in-situ testing.
2. Perform Charpy V-Notch testing of broken rods at room temperature and at 40 degrees F.
3. Perform reduced section tensile tests (.505 diameter) of the broken rods as close to the fracture surface as possible. Tensile tests to be performed as detailed in Section A.
4. Perform hardness Testing (Rockwell C and Knoop Micro-hardness) of broken rods.
5. Perform chemical analysis of broken rods at the threaded area and at the shank. Chemical tests to be performed as detailed in Section B.
6. Perform scanning electron microscopy - examination of fracture features on broken rods.
7. Perform Micro-structural examination of broken rods at the threaded area.

Note: It is expected that loading of the 192 bolts for 30 days will allow any existing hydrogen atoms to propagate in between the grain boundaries of the steel. Therefore, even if the bolts do not fail within the 30 day period, the scanning electron microscopy will provide sufficient information necessary to determine presence of Hydrogen.

Revision No.	By	Date	SELF-ANCHORED SUSPENSION BRIDGE		
			E2 Bearings & Shear Keys - Testing Protocol		
			Drawn By: BD	SHEET NUMBER	SK-01
			Date: 4/1/2013		

10 sample rods selected for instrumentation

All 192 rods stressed per plan

10 sample rods will be removed for destructive testing



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Testing will also include:

**Additional electron microscopy of
other fractured rods**

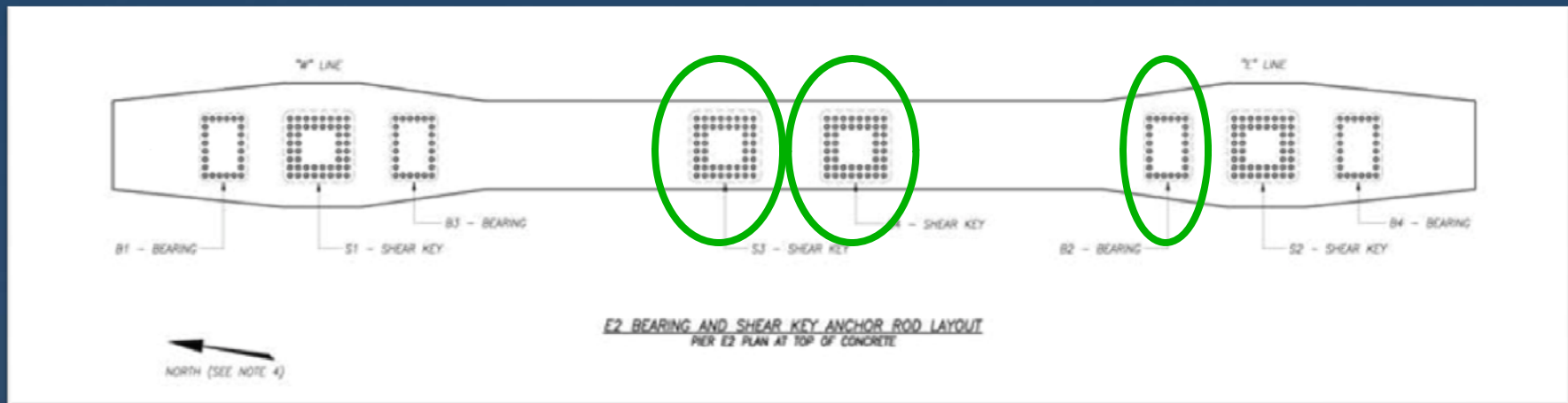
**Additional borescope evaluation of
other fractured rods**

**Sampling and testing of water if
found during borescope evaluation**



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Testing began with stressing of 120 rods

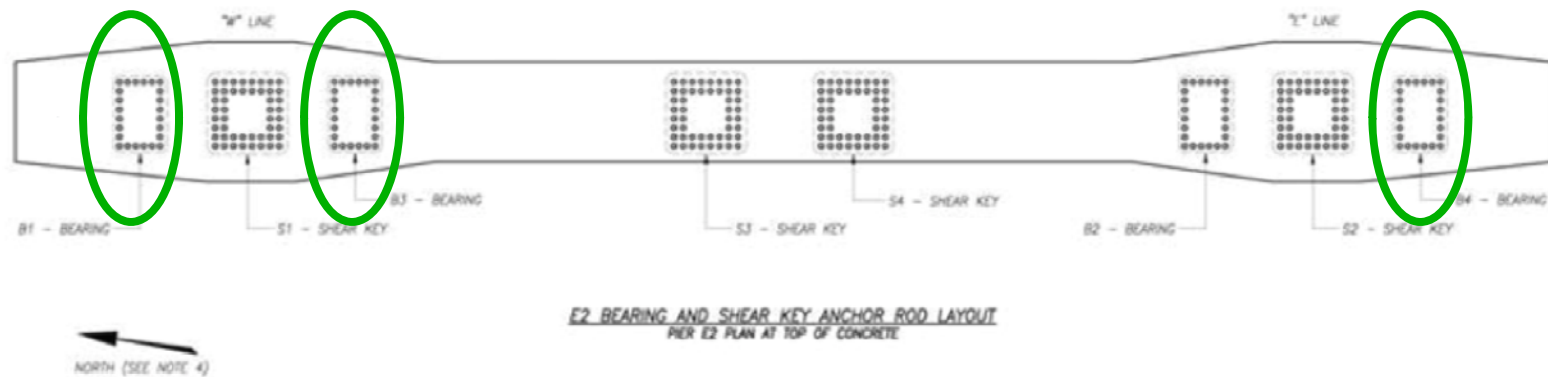
Rods are inspected daily

To date, 11 days after stressing, no rods
have fractured



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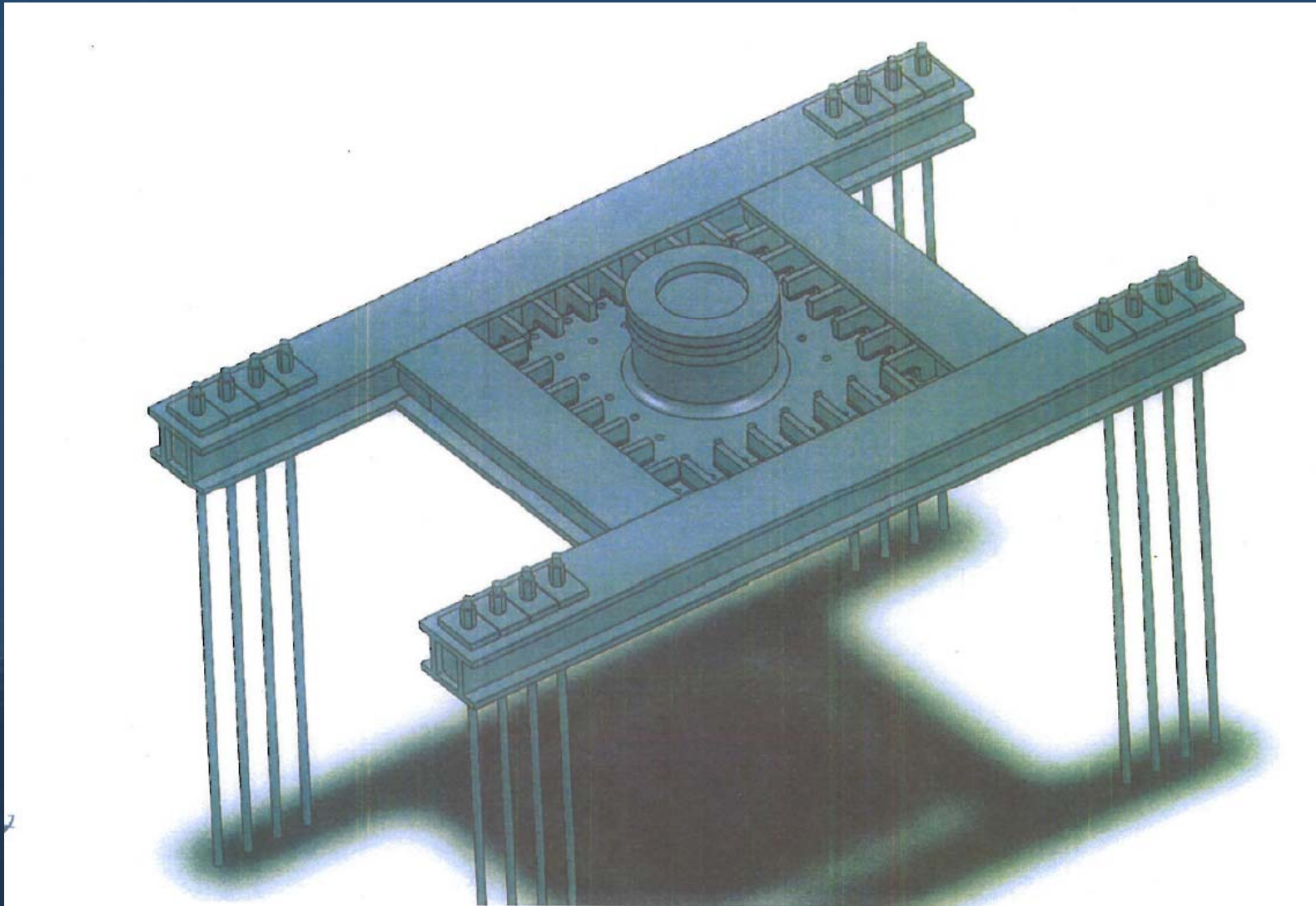
Remaining 72 rods were stressed as of April 9.

All 10 sample rods have been instrumented



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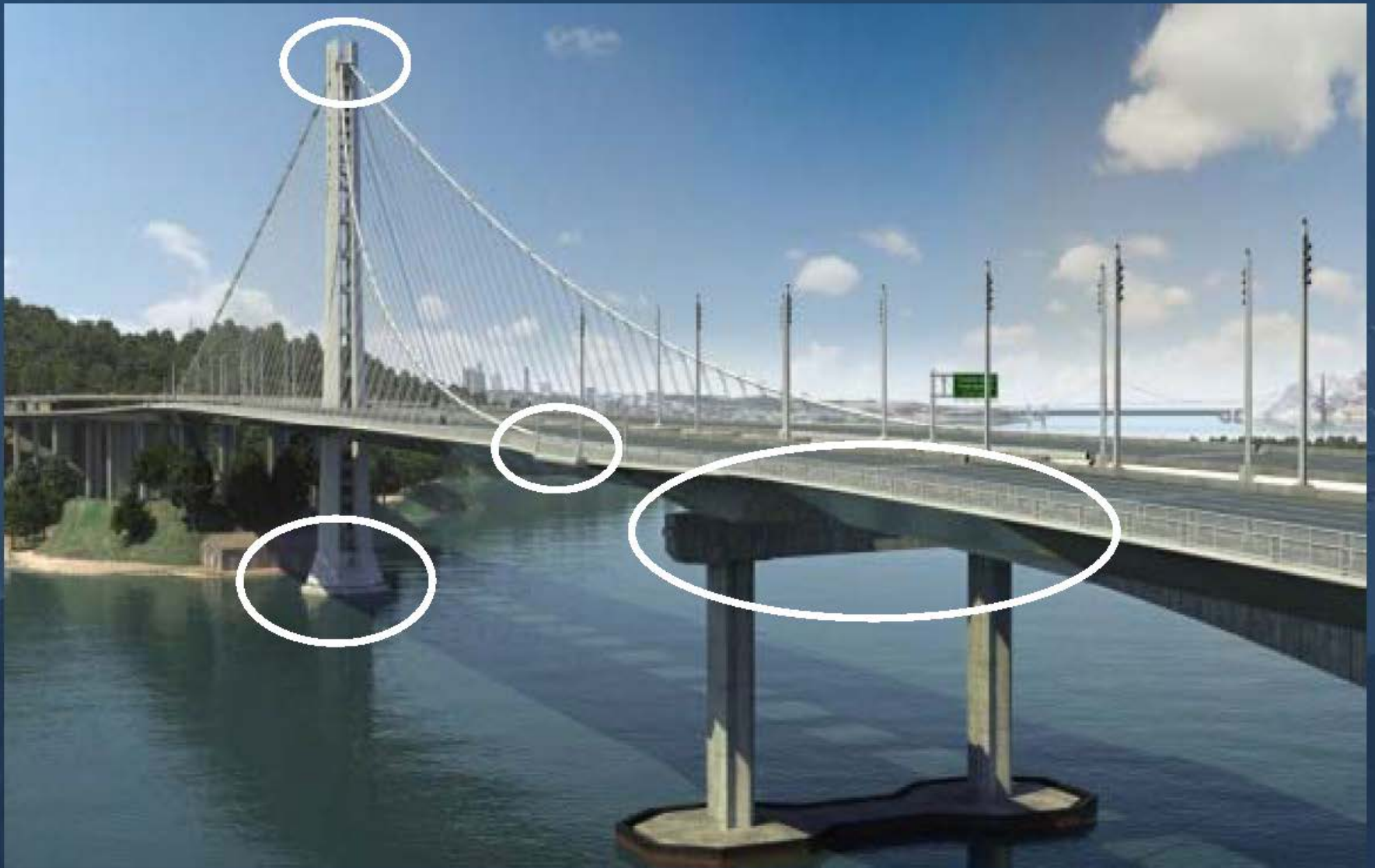


Conceptual design – steel collar



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Summary

**Continuing investigation on cause of failure in
2008 anchor rods**

Continuing design of shear key retrofit

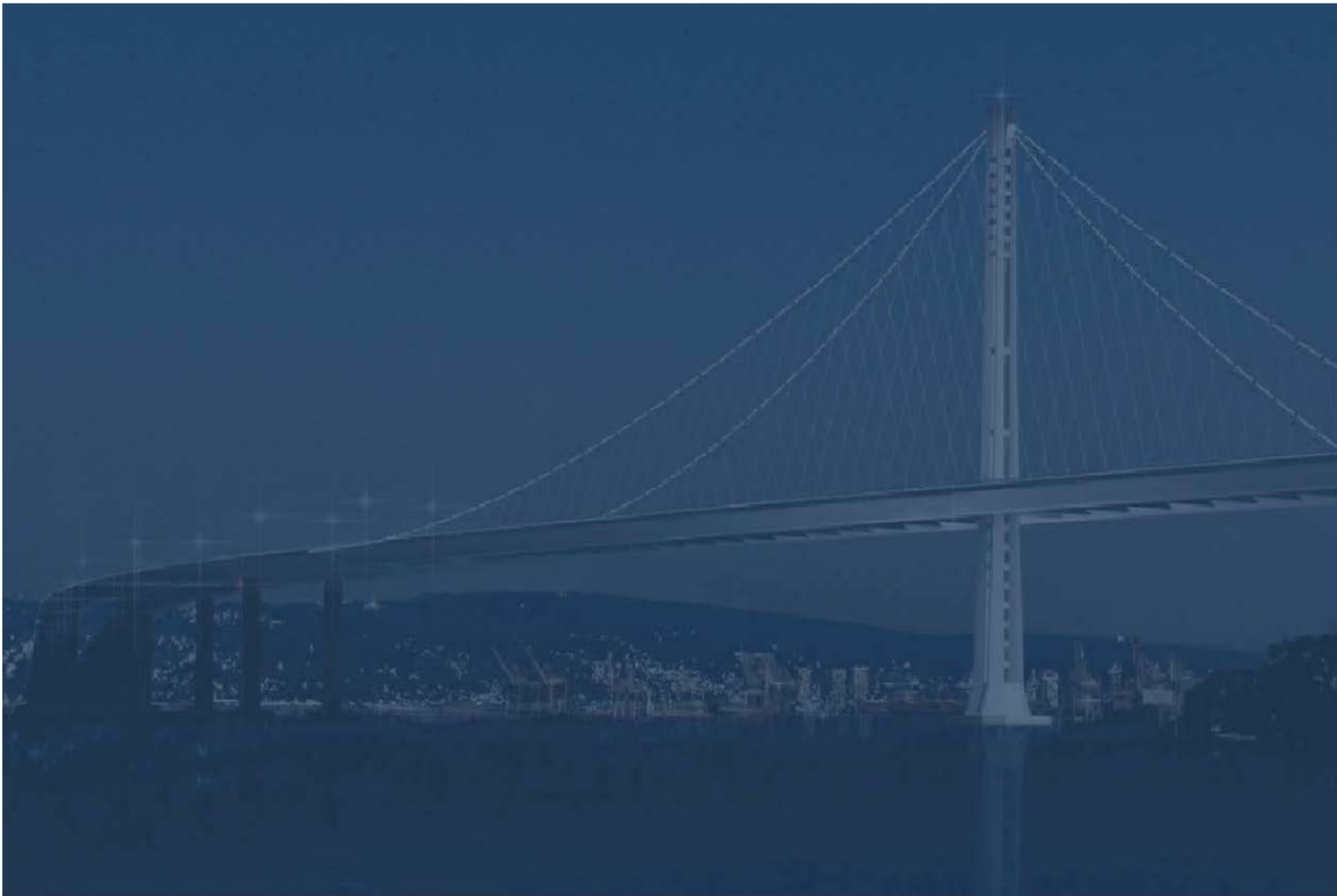
Tensioning and testing of 2010 anchor rods

Continuing communication at BATA meetings



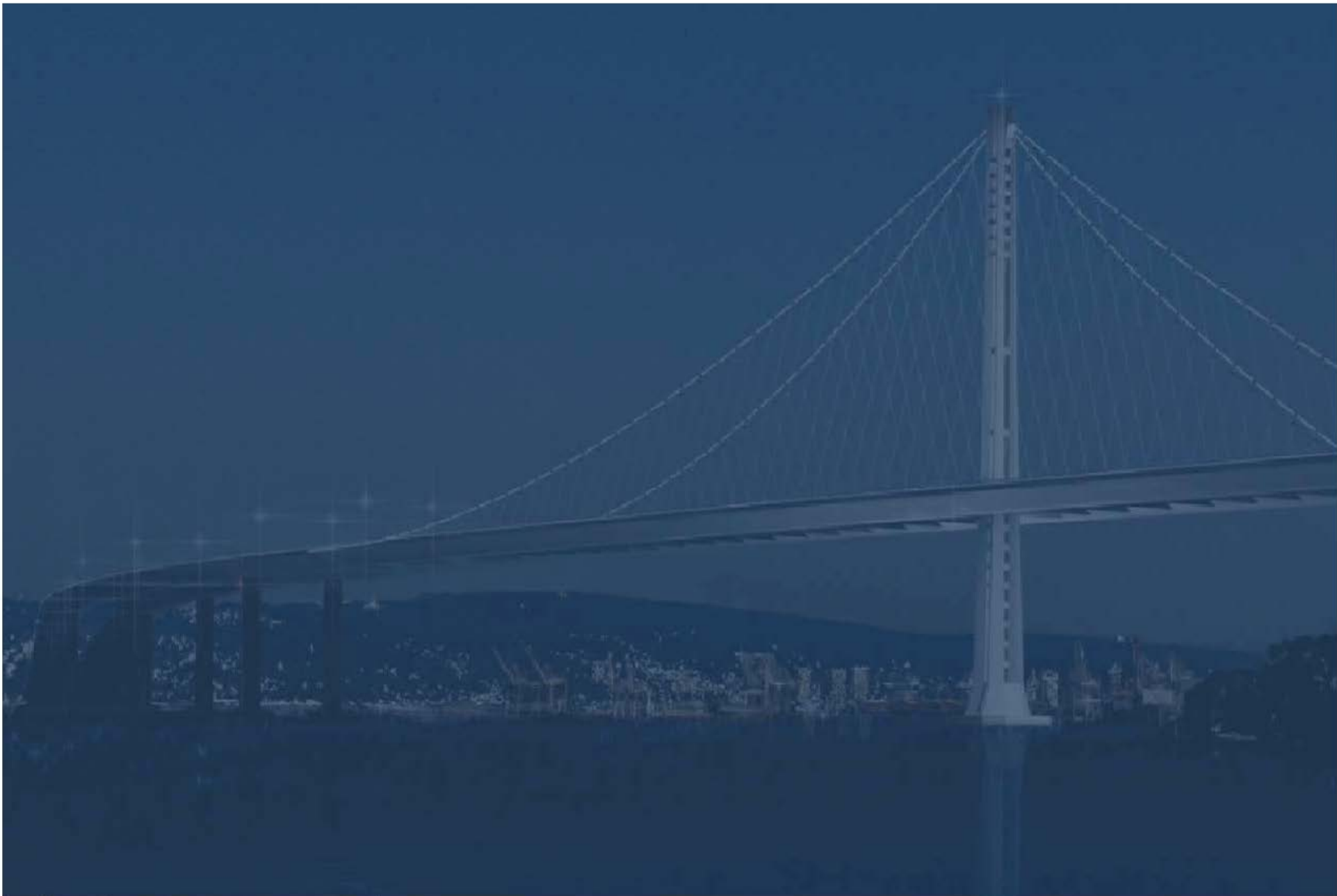
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Memorandum

TO: Toll Bridge Program Oversight Committee (TBPOC) **DATE:** April 9, 2013

FR: Andrew Gordon, Bay Bridge Spokesperson, BATA

RE: Agenda No. - 2c
San Francisco-Oakland Bay Bridge Updates
Item- Summary of Media Release Package

Recommendation:

For Information Only

Cost:

N/A

Schedule Impacts:

N/A

Discussion:

A verbal update on the media release package for the anchor rods will be provided at the TBPOC April 9 conference call.

Attachment(s):

N/A

ITEM 3: OTHER BUSINESS

No Attachments